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| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|-----------------|-------------|----------------------|---------------------|------------------|
| 10/526,513      | 03/04/2005  | Torsten Solf         | PHDE020203US        | 8935             |

7590 11/14/2007  
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Cleveland, OH 44143

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| EXAMINER |
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BITAR, NANCY

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| ART UNIT | PAPER NUMBER |
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2624

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| MAIL DATE | DELIVERY MODE |
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11/14/2007

PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

|                              |                               |                             |  |
|------------------------------|-------------------------------|-----------------------------|--|
| <b>Office Action Summary</b> | Application No.<br>10/526,513 | Applicant(s)<br>SOLF ET AL. |  |
|                              | Examiner<br>Nancy Bitar       | Art Unit<br>2624            |  |

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 04 March 2005.
- 2a) ☐ This action is FINAL.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-10 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-10 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 04 March 2005 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
     Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
     Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All    b) ☐ Some \* c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |   |   |
|---|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892)  | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date: _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)  | 5) <input type="checkbox"/> Notice of Informal Patent Application                       |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)<br>Paper No(s)/Mail Date <u>03/04/2005</u> | 6) <input type="checkbox"/> Other: _____  |

## **DETAILED ACTION**

### ***Claim Rejections - 35 USC § 112***

1. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

2. Regarding claim 9, the phrase "in such a manner" renders the claim indefinite because it is unclear whether the limitations following the phrase are part of the claimed invention. See MPEP § 2173.05(d).

### ***Claim Rejections - 35 USC § 102***

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

4. Claims 1-2 are rejected under 35 U.S.C. 102(b) as being unpatentable by Gueziec et al (US 5,951,475).

As to claim 1, Gueziec teaches a method of optimizing a two-dimensional image of a body volume, which contains an object, in which method a three-

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dimensional representation of feasible locations of the object within the body volume is acquired (generating, from CT or MRI data, a three dimensional model of a surgical tissue of interest, see abstract) ; the current position of the object is determined and associated with the three-dimensional representation ; imaging parameters which are optimum in respect of the position of the object are determined by means of the three-dimensional representation , and a two-dimensional image of the body volume is generated by means of said optimum imaging parameters (obtaining at least two, two dimensional, preferably fluoroscopic, x-ray images representing at least two views of the surgical tissue of interest, the images containing radio-opaque markers for associating an image coordinate system with a surgical (robot) coordinate system, see abstract, note that a thin plate spline function is fitted to each two dimensional coordinate (x, y location) of the marker position data, column 3, lines 25-30)).

As to claim 2, Gueziec teaches a method as claimed in claim 1, wherein the two-dimensional image is a projection of the body volume, which has been generated by means of X-rays (a system and method for anatomy based registration of a three-dimensional CT-scan to two dimensional x-ray projection data, column 2, lines 50-55).

### ***Claim Rejections - 35 USC § 103***

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to

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be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

6. Claims 3-10 rejected under 35 U.S.C. 103(a) as being unpatentable over Gueziec et al (US 5,951,475) and Graumann et al (US 6,317,621).

As to claim 3, Gueziec teaches an imaging system for forming a two-dimensional image of a body volume which contains an object, which system comprises a data processing unit with a memory (data processor 16) which stores a three-dimensional representation of feasible locations of the object within the body volume, the data processing unit being arranged (register 3-D volumetric data, such as that obtained for a CT-scan, to a 2-D radiographic image. Such a registration is used, in accordance with a preferred embodiment of this invention, to correlate a surgical plan, that is based upon the 3-D CT-scan data, with the accurate location of a patient on the operating table, column 24, lines 31-37); a) to determine imaging parameters which are optimum in respect of the current position of the object by means of the three-dimensional representation or u know what we pass by him (a 3-D projection line can be fully specified in robot space for each image pixel. The calibration uses the above mentioned image calibration device, embodied in a radiolucent rod with removable metallic beads, or uses a stationary calibration grid device that is interposed along the optical axis of the x-ray system, and which has points that are touched by the robot during the calibration procedure for providing a position reference, column 3, lines 47-58) ; b) to control the imaging system in such a manner that it generates a

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two-dimensional image with said imaging parameters ( note that rod 12 can thus be controllably positioned by the robot 10 along parallel planes that are generally perpendicular to an optical axis (OA) of a fluoroscopy system comprised of an x-ray source 14A and an image intensifier (camera) 14B. A radio-opaque probe 12C (length 15 mm) may be fitted into the opposite end of the rod 12. The probe 12C is useful for precisely corresponding the robot to the orientation and position of the rod 12, as the probe's position marks the end of the rod, and also indicates the rod's pointing direction, column 5, lines 25-52). While Gueziec et al meets a number of the limitations of the claimed invention, as pointed out more fully above, Gueziec fails to specifically teaches controlling the imaging system . Specifically, Graumann et al. teaches the use of the use of a C-arm x-ray device for 3D-angiography, markers are detected in at least two 2D-projection images, from which the 3D-angiogram is calculated, and are projected back onto the imaged subject in the navigation computer and are brought into relation to the marker coordinates in the patient coordinate system using the projection matrices applied to the respective 2D- projection images. Because Graumann teaches controlling the imaging system in such a manner that it generates a two dimensional images with said imaging parameters . It would have been obvious to one of ordinary skill in the art to use the controlling means in Gueziec in order to form x-ray images from different projection direction .Therefore, the claimed invention would have been obvious to one of ordinary skill in the art at the time of the invention by applicant.

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As to claim 4, Graumann teaches an imaging system as claimed in claim 3, wherein it includes an X-ray apparatus with an X-ray source and a detector which are attached to a movable C-arm (C-arm X-ray system, column 2, lines 40-57).

As to claim 5, Gueziec teaches an imaging system as claimed in claim 4, wherein the X-ray apparatus includes adjustable diaphragms whose adjustment forms part of the imaging parameters optimized by the data processing unit (data processor 16).

As to claims 6 and 7, Gueziec teaches an imaging system as claimed in claim 3, wherein it is arranged to determine the current position of the object from a two-dimensional image (the registration of a 3D object to a 2D projection or pose recovery involves finding the 3D position and orientation of the camera that would have produced the given projection, column 24, lines 18-30).

As to claims 8 and 9, Gueziec teaches an imaging system as claimed in claim 3, wherein the feasible locations of the object are vessels within a biological body volume, and that the data processing unit is arranged to define the optimum imaging parameters in such a manner that the segment of the vascular tree in which the object is situated is projected essentially in a planar fashion in the two-dimensional image (FIG. 1A, the calibration rod 12 is positioned along two ruled surfaces that are referred to as the "near plane" and the "far plane". In this description it is assumed that such surfaces are planar, but the method is not restricted to planes. The "near plane" is the plane closer to the

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x-ray source 14A and further away from the x-ray detector (image intensifier 14B) than the far plane)

As to claim 10, Gueziec teaches an imaging system as claimed in claim 3, wherein it includes a device for the formation of images and is arranged to display the two-dimensional image in superposed form together with an image formed from the three-dimensional representation with completely the same or partly the same imaging parameters (The effect is that the image of the beads forms a calibration grid that is superimposed on the x-ray image data that is output from the image intensifier 14B to the data processor 16, figure 1B,1C), the image formed from the three-dimensional representation preferably reproducing an area which is larger than that reproduced by the two-dimensional image (The area is then determined by computing first the areas of the triangles formed with the origin and a polygon segment and by summing such areas. Once the polygonal curves defining the markers have been extracted the method retains the (x,y) coordinate on the marker in the image. These coordinates are measured in the image coordinate system with respect to an image origin, note that the three-dimensional coordinate is greater than the two dimensional image, note that the superimposition of 3-D models on 2-D images helps in achieving realistic texture mapping to the models).

7. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Nancy Bitar whose telephone number is 571-



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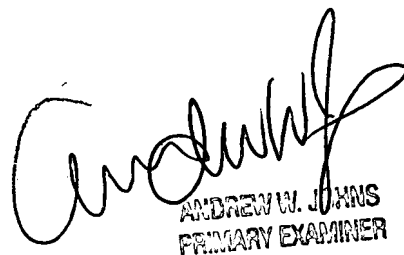
270-1041. The examiner can normally be reached on Mon-Fri (7:30a.m. to 5:00pm).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Bhavesh Mehta can be reached on 571-272-7453. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Nancy Bitar

11/8/2007

  
ANDREW W. JOHNS  
PRIMARY EXAMINER